

## ***Ampharete undecima*, a new deep-sea ampharetid (Annelida, Polychaeta) from the Norwegian Sea**

TOM ALVESTAD<sup>1</sup> (<http://zoobank.org/urn:lsid:zoobank.org:author:8A7B0958-8630-42E5-B957-B9DCD308D031>),  
JON ANDERS KONGSRUD<sup>2</sup> (<http://zoobank.org/urn:lsid:zoobank.org:author:4AF3F49E-9406-4387-B282-73FA5982029E>) AND  
KATRINE KONGSHAVN<sup>2</sup> (<http://zoobank.org/urn:lsid:zoobank.org:author:2DF65B94-8531-4377-908F-5A81407F7DF7>)

<sup>1</sup> Uni Research, Thormøhlensgate 55, N-5020 Bergen, Norway (tom.alvestad@uni.no)

<sup>2</sup> Natural History Collections, University Museum of Bergen, Allègaten 41, 5007 Bergen, Norway (Jon.kongsrud@um.uib.no; Katrine.kongshavn@um.uib.no)

\* To whom correspondence and reprint requests should be addressed. E-mail: Jon.kongsrud@um.uib.no

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### **Abstract**

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*Ampharete undecima*, a new deep-sea polychaete belonging to the family Ampharetidae, is described from slope depths in the Norwegian Sea. The new species is of small size, up to 5 mm long and 0.5 mm wide, and thus it may have been overlooked in previous studies. It is shown to be a common and widespread species in the Nordic Seas in depths ranging from 600–1650 m. The new species is referred to the genus *Ampharete* based on characteristics of the prostomium, the presence of buccal tentacles with secondary pinnulae, four pairs of branchiae arising from fused segment II + III, 12 thoracic uncinigerous segments, and a single pair of nephridial papillae on segment IV. The new species differs from all known species of *Ampharete* in having 11 rather than 12–28 abdominal uncinigerous segments.

### **Keywords**

MAREANO, Nordic Seas, Arctic, Norway, Ampharetidae, PolyNor, new species

### **Introduction**

The genus *Ampharete* Malmgren, 1866, as defined by Jirkov (2011), is a species-rich genus of sediment-dwelling polychaetes, comprising about 40 nominal species worldwide (Parapar et al., 2012). The Northern Atlantic and Arctic species of *Ampharete* have been well studied by several authors, including Holthe (1986), Jirkov (1997, 2001) and Parapar et al. (2012). However, information about the occurrence and distribution of *Ampharete* in the deeper parts of the Nordic Seas is still inadequate, and taxonomic challenges were indicated by Jirkov (2001). The water masses below ~650 m depth in the Nordic Seas are of Arctic origin, with temperatures below 0°C, and differ significantly from the relatively warm surface waters, which are of Atlantic origin (Blindheim and Østerhus, 2005). A major shift in species diversity and composition in the Nordic seas related to the different water masses has been indicated for several invertebrate taxa, including polychaetes (Svavarsson et al., 1993; Høisæter, 2010; Kongsrud et al., 2011; Bakken et al., 2014).

The present study is based on material from a large number of samples from deep-water habitats in the Nordic Seas collected during several cruises with RV *H. Mosby* in the 1980s (organised by the University of Bergen) and from the

ongoing large-scale mapping program MAREANO (Marine AREA database for NORwegian waters, 2013). During general identification work of polychaetes from widespread deep-sea samples from the Nordic Seas, numerous specimens representing an undescribed species of *Ampharete* were encountered. The new species is of diminutive size (less than 5 mm in length) and may thus have been overlooked in previous studies. In the present study, we formally describe this new species of *Ampharete* utilising scanning electron microscopy to study and illustrate morphological characteristics. Further, based on presence or absence of the new species in a large number of deep-sea samples from the Nordic Seas, we describe the occurrence and distribution of the new species in the area.

### **Materials and methods**

A large portion of the material used in the present study originates from several cruises with RV *H. Mosby* in the period 1981–1987 to different areas of the Nordic Seas (see Kongsrud et al. (2011) for details), collected using an RP-sledge (Brattegard and Fosså, 1991). The MAREANO samples were collected in 2008 and 2009 from off the north-west coast of Norway using an RP-sledge and a van Veen grab (0.2 m<sup>2</sup>) (MAREANO 2013). The remaining few samples were

collected in 1990 during the RV *Meteor* cruise west of Bear Island at about 75°N using an RP-sledge, and from environmental monitoring off the west coast of Norway collected using a box corer. All sampling localities are shown in fig. 1. Geographical positions are given in decimal degrees.

All samples included in the present study have been washed through sieves with a mesh size of 0.5 mm. The materials have been prefixed in 10% formaldehyde and subsequently transferred to 75% alcohol. All examined specimens are deposited in the Natural History Collections, University Museum of Bergen, Norway (ZMBN).

The specimens were identified using dissecting and compound microscopes. Staining with methyl blue has been used to aid in identification. Line drawings of the holotype were prepared using a dissecting microscope with a camera lucida. SEM images were made using a ZEISS Supra 55VP microscope at the Laboratory for Electron Microscopy, University of Bergen.

## Systematics

Family **Ampharetidae** Malmgren, 1866

Genus ***Ampharete*** Malmgren, 1866

***Ampharete undecima*** sp. nov.

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Figures 2–6

*Type locality.* Norwegian Sea, 72.367°N 14.895°E, 770 m depth.

*Type material.* RV *G.O. Sars* MAREANO stn R379-47, RP, 9 Apr 2009, holotype (ZMBN 94022), 2 paratypes mounted for SEM (ZMBN 94023), 19 paratypes (ZMBN 94024), 19 paratypes (ZMBN 94025) and 1 paratype (ZMBN 94026).

*Additional material.* RV *H. Mosby*: Stn 81.03.21.1, 63.166°N 4.816°E, 830 m, 21 Mar 1981 (1 spec.); stn 81.06.04.4, 66.983°N 4.270°E, 1380 m, 4 Jun 1981 (1); stn 81.06.06.7, 65.716°N 5.238°E, 794 m, 6 Jun 1981 (34); stn 81.06.06.8, 65.666°N 4.815°E, 996 m, 6 Jun 1981 (9); stn 81.08.16.3, 62.800°N 1.043°E, 1009 m, 16 Aug 1981 (3); stn 82.01.21.2, 62.491°N 1.721°E, 604 m, 21 Jan 1982 (6); stn 82.01.21.4, 62.560°N 0.981°E, 804 m, 21 Jan 1982 (5); stn 82.01.21.6, 62.803°N 1.088°E, 984 m, 21 Jan 1982 (5); stn 82.08.15.1, 63.048°N 0.808°E, 1286 m, 15 Aug 1982 (2); stn 82.08.23.1, 63.213°N 3.121°E, 1003 m, 23 Aug 1982 (3); stn 82.11.26.1, 63.178°N 2.765°E, 1030 m, 26 Nov 1982 (1); stn 82.11.27.1, 62.985°N 3.218°E, 804 m, 27 Nov 1982 (73); stn 83.06.02.1, 62.198°N 0.003°W, 708 m, 2 Jun 1983 (15); stn 83.06.03.2, 60.201°N 6.625°W, 1220 m, 3 Jun 1983 (55); stn 83.06.08.1, 65.168°N 9.493°W, 784 m, 8 Jun 1983 (4); stn 83.06.08.2, 65.460°N 7.588°W, 1626 m, 8 Jun 1983 (3); stn 83.06.17.2, 62.338°N 1.411°W, 543 m, 17 Jun 1983 (1); stn 83.06.17.3, 62.593°N 1.233°W, 781 m, 17 Jun 1983 (18); stn 84.05.23.1, 62.585°N 1.793°W, 656 m, 23 May 1984 (328); stn 84.05.23.3, 62.508°N 1.851°W, 576 m, 23 May 1984 (5); stn 84.05.23.7, 62.411°N 1.540°W, 575 m, 23 May 1984 (2); stn 84.11.20.2, 63.133°N 1.895°W, 1087 m, 20 Nov 1984 (29); stn 84.11.21.1, 62.791°N 1.836°W, 811 m, 21 Nov 1984 (2); stn 85.01.08.1, 62.525°N 1.443°W, 701 m, 08 Jan 1985 (135); stn 85.01.08.2, 62.706°N 1.186°W, 897 m, 08 Jan 1985 (44); stn 85.01.12.2, 63.166°N 0.643°W, 1489 m, 12 Jan 1985 (1); stn 85.01.12.3, 63.048°N 0.796°W, 1293 m, 12 Jan 1985 (1); stn 86.06.13.1, 63.218°N 7.031°W, 1261 m, 13 Jun

1986 (1); stn 86.07.25.1, 69.023°N 8.410°W, 879 m, 25 Jul 1986 (10); stn 86.07.27.2, 70.810°N 9.728°W, 886 m, 27 Jul 1986 (6); stn 86.08.15.5, 62.610°N 1.573°W, 654 m, 15 Aug 1986 (26); stn 86.08.15.7, 62.843°N 1.431°W, 951 m, 15 Aug 1986 (15); stn 86.08.17.5, 62.996°N 1.140°W, 1143 m, 17 Aug 1986 (4); stn 86.08.17.6, 62.691°N 1.756°W, 750 m, 17.08.1986 (115). RV *Meteor*: Stn M410/90, 74.843°N 15.377°W, 894 m, 16 Jul 1990 (79); stn M507/90, 74.883°N 15.275°W, 991 m, 28 Jul 1990 (87). RV *G.O. Sars* MAREANO: Stn R209-17, GR, 69.800°N 16.420°W, 1590 m, 5 Jun 2008 (1); stn R209-18, GR, 69.800°N 16.420°W, 1590 m, 5 Jun 2008 (1); stn R229-27, GR, 69.142°N 13.682°W, 1115 m, 11 Jun 2008 (1); stn R232-34, GR, 69.407°N 14.696°W, 1408 m, 14 Jun 2008 (1); stn R297-346, GR, 68.653°N 11.908°W, 807 m, 14 Oct 2008 (3); stn R297-347, GR, 68.653°N 11.908°W, 807 m, 14 Oct 2008 (1); stn R351-355, GR, 68.840°N 13.087°W, 765 m, 29 Oct 2008 (2); stn R351-356, GR, 68.840°N 13.087°W, 765 m, 29 Oct 2008 (2); stn R379-363, GR, 72.367°N 14.895°W, 760 m, 9 Apr 2009 (5); stn R379-47, RP, 72.367°N 14.895°W, 770 m, 9 Apr 2009 (10); stn R391-370, GR, 72.278°N 15.666°W, 729 m, 12 Apr 2009 (5); stn R391-51, RP, 72.281°N 15.666°W, 728 m, 12 Apr 2009 (34); stn R397-54, RP, 72.247°N 15.945°W, 635 m, 14 Apr 2009 (3); stn R404-381, GR, 72.078°N 15.806°W, 621 m, 15 Apr 2009 (1); stn R405-59, RP, 72.140°N 15.346°W, 899 m, 20 Apr 2009 (20); stn R406-61, RP, 72.189°N 14.829°W, 1030 m, 21 Apr 2009 (20); stn R444-148, RP, 71.741°N 15.236°W, 993 m, 20 Sep 2009 (7); stn R776-51, BC, 68.189°N 10.362°W, 873 m, 3 May 2012 (1). Environmental monitoring: Stn V-12, 67.002°N 5.334°W, 1330 m, 1 Jun 1998 (2).

*Diagnosis.* A small species of up to 5 mm in length and 0.5 mm in width. Branchiae arranged close together; three pairs in anterior transverse row and last pair in a posterior position. Paleae long, thin and slender with curved tips, 9–12 on each side. Abdomen with 11 chaetigerous segments. Pygidium with two short conical lateral cirri and a number of small rounded papillae.

*Description.* Holotype, complete, 4 mm long and 0.4 mm wide in thorax (fig. 2A–B). Other complete specimens are up to 5 mm in length and 0.5 mm in width. Colour in alcohol pale yellow.

Prostomium trilobed, without glandular ridges or eyes; prostomial median lobe delimited by deep lateral grooves, widest at the base, gradually narrowing to form acute, rounded frontal part (fig. 3A–B). Paired nuchal organs as circular, ciliated spots located in lateral grooves at base of median prostomial lobe (fig. 3B). Buccal tentacles with secondary filaments, pinnae; tips of pinnae covered by tufts of cilia (fig. 4B–C). Four pairs of long branchiae on fused segment II+III; three pairs of branchiae arranged in anterior, transverse row without median gap, fourth pair slightly posterior to anterior row, between 2nd outermost and innermost branchiae of anterior row (fig. 2C). Bases of branchiae in anterior row completely fused, forming a characteristic and well-marked edge above head in frontal view (fig. 3A–B). Branchiae of segment II in 2nd outermost position of anterior row, branchiae of segment III in outermost position of anterior row, branchiae of segment IV in innermost position of anterior row, branchiae of segment V in posterior position (figs 2C, 4A). One pair of nephridial papillae, located dorsally between the two posterior branchiae on segment IV (figs 2C, 4A). Fused segment II and

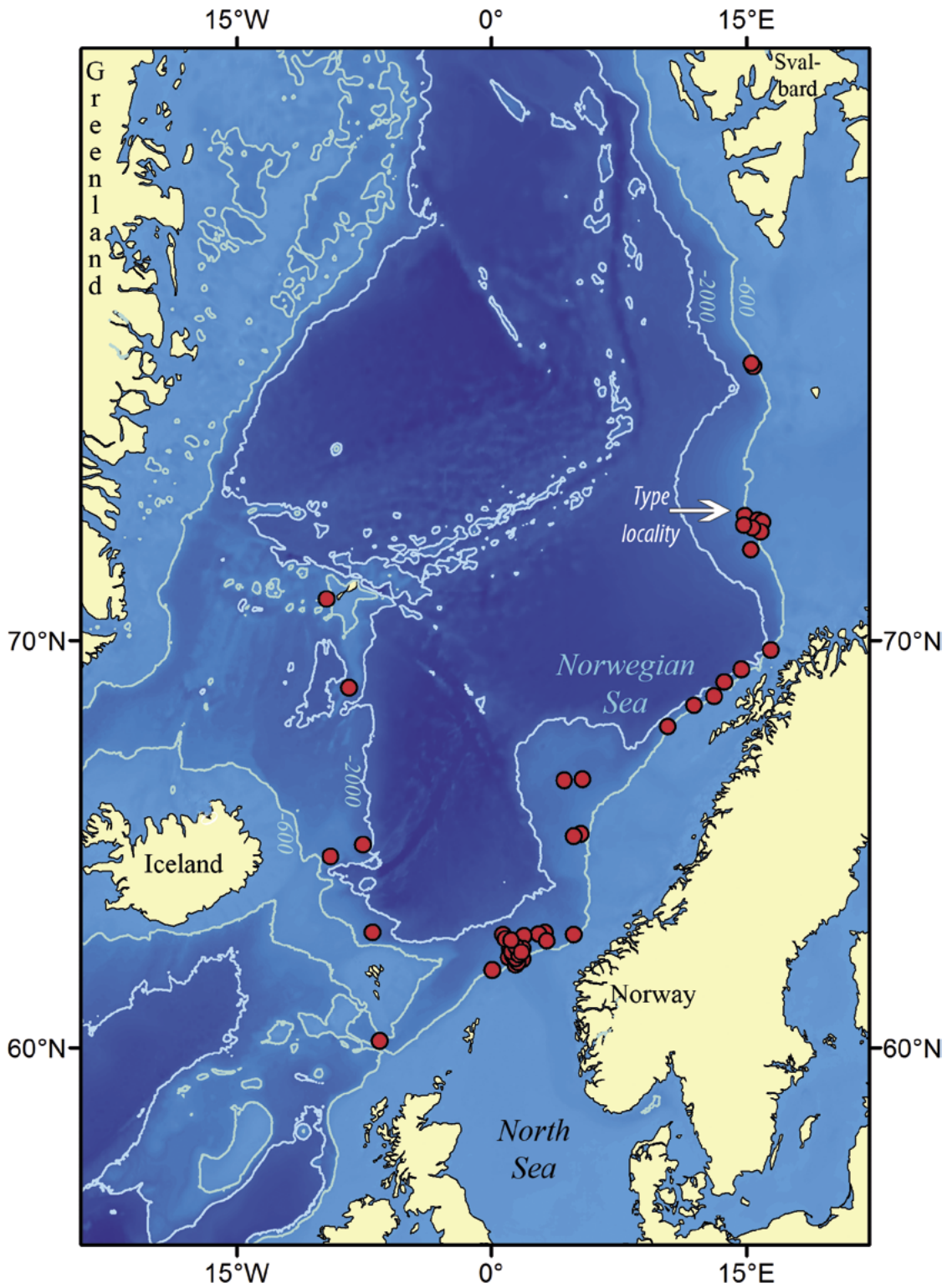


Figure 1. Map of the Nordic Seas showing type locality and records of *Ampharete undecima* sp. nov. Background map based on GEBCO08 and the Ocean Basemap (March 2013) by ESRI.

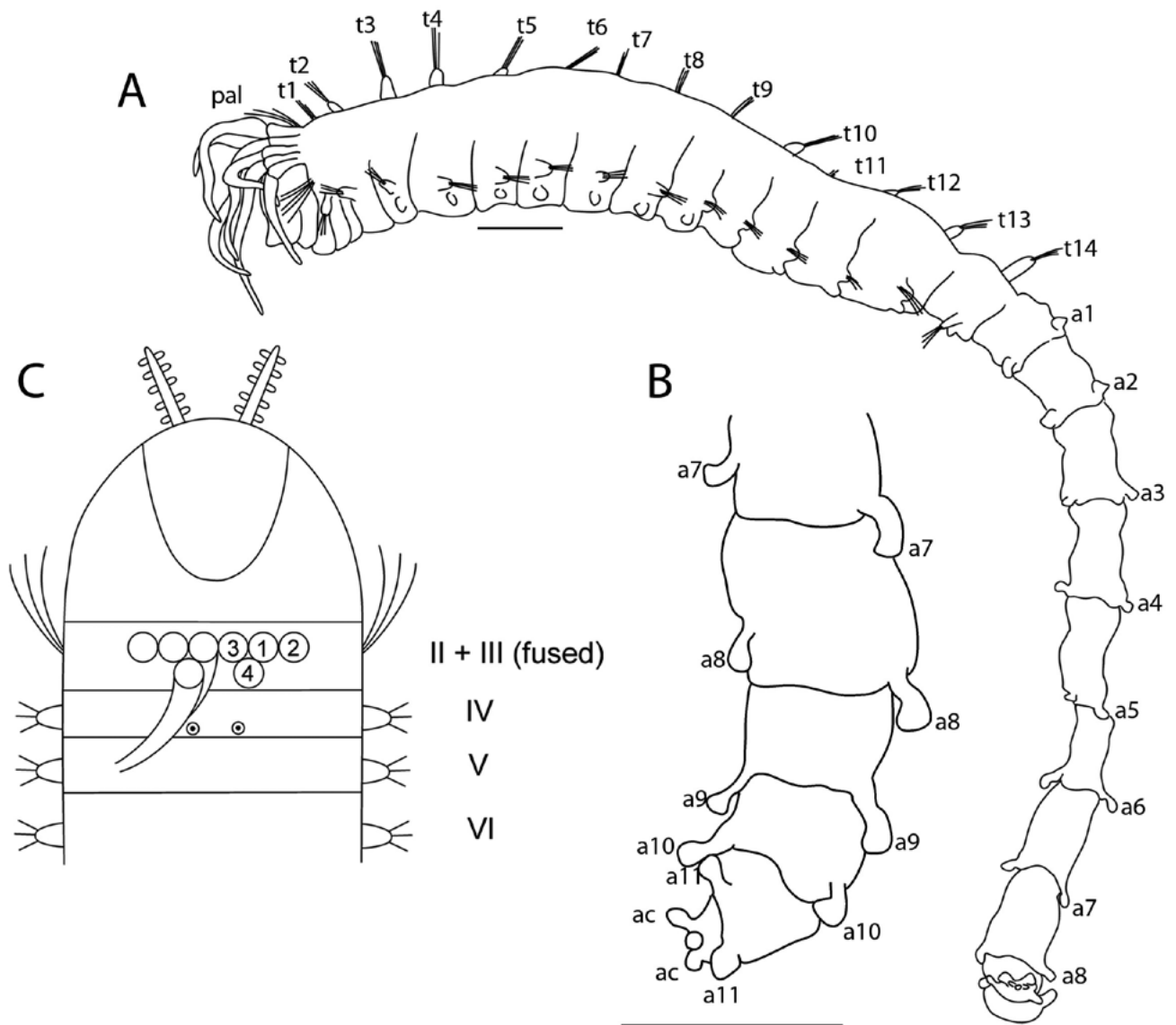


Figure 2. *Ampharete undecima* sp. nov. (A) Habitus of holotype (ZMBN 94022), dorsolateral view, posterior part of body twisted and the last 3 abdominal chaetigers are not distinguishable in drawing; (B) posterior end of holotype, ventral view; (C) schematic drawing of head and anterior end of body, indicating placement and origin of branchiae, and position of paired nephridial papillae on segment IV. Abbreviations: a1–11, abdominal chaetigers; ac, anal cirri; pal, paleae; t1–14, thoracic chaetigers. Scale bars: 250  $\mu$ m.

III with 9–12 long, thin and slender paleae on each side, with curved tips (figs 3B, D, 5A). Thorax and abdomen of similar length; thorax slightly wider than abdomen, slightly tapering posteriorly (figs 2A, 3C). Abdomen of similar width throughout, or slightly tapering posteriorly. A total of 14 thoracic segments with notopodia and capillary chaetae. Last 12 chaetigers of thorax with neuropodia and uncini (figs 2A, 3A, C). Notopodia simple, finger-shaped; first 2 reduced, remaining 12 up to 3 times longer than wide. Notochaetae as spinulose capillaries (fig. 5F–G), arranged in double rows;

capillaries from anterior row generally thinner and shorter than from posterior row. Thoracic neuropodia rounded to oval (fig. 3C). Thoracic uncini with two vertical rows of 4–6 teeth above rostrum (fig. 5B–C). Continuous ventral shields present to thoracic unciniger 8. A total of 11 abdominal uncinigers (fig. 2A–B, 3C). Anterior 2 abdominal segments with neuropodia as thoracic type (fig. 3C); remaining abdominal uncinigers with enlarged neuropodia without cirri (figs 3A, C, 5D). Abdominal uncini with 4 vertical rows of 4–6 teeth above rostrum (fig. 5D–E). Pygidium with

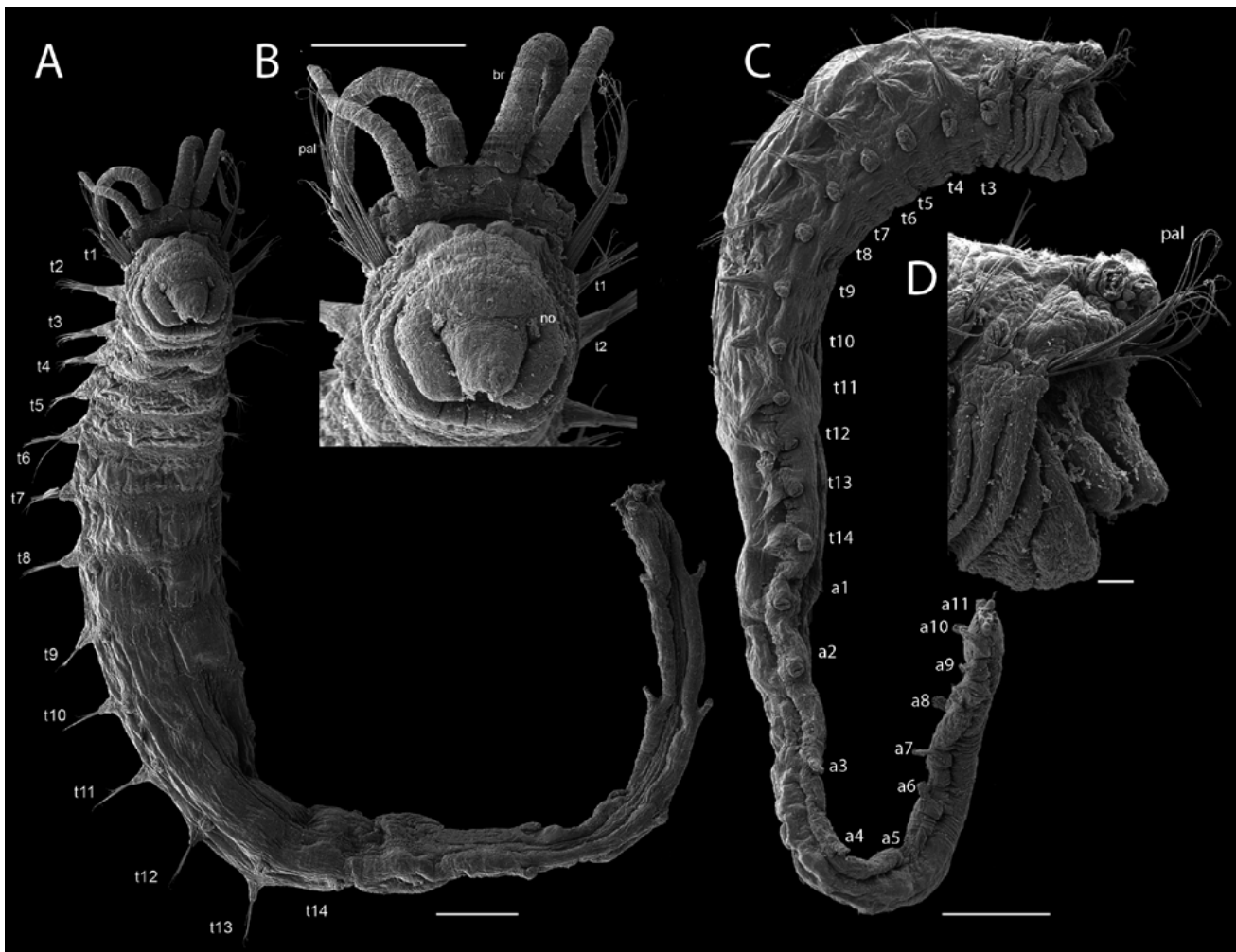


Figure 3. *Ampharete undecima* sp. nov. (A) Habitus, frontal and ventral view, posterior end of body missing; (B) head, frontal view, enlarged from A; (C) habitus, lateral view; (D) head, lateral view, enlarged from C. A–B, paratype (ZMBN 94023, spm #1); C–D, paratype (ZMBN 94023, spm #2). Abbreviations: a1–11, abdominal chaetigers; br, branchiae; no, nuchal organs; pal, paleae; t1–14, thoracic chaetigers. Scale bars: A, C, 200  $\mu$ m; B, D, 20  $\mu$ m.

terminal ciliated anal opening, surrounded by 2 short lateral cirri and small rounded papillae (figs 2B, 4D). Head and ventral shields dyed by methyl blue; anterior tip of prostomium with particularly strong colour (fig. 6A–C). Tube unknown.

**Distribution.** Common and widespread in the Nordic Seas in depths ranging from 600–1650 m (fig. 1).

**Etymology.** The species is named after the Latin word for eleven, referring to the eleven abdominal segments.

**Remarks.** *Ampharete undecima* sp. nov. is referred to the genus *Ampharete* based on the presence of a trilobed prostomium without glandular ridges, and with the median lobe delimited by deep grooves, buccal tentacles with pinnulae, the presence of four pairs of branchiae arising from the fused segment

II+III, 12 thoracic uncinigers, and a single pair of nephridial papillae located dorsally on segment IV (Parapar et al., 2012; Imajima et al., 2012).

*Ampharete undecima* sp. nov. differs from all known species of *Ampharete* in having 11 rather than 12–28 abdominal uncinigerous segments. In the Norwegian Sea, *A. undecima* sp. nov. commonly occurs together with two other species of the genus, *A. cf. lindstroemi* (Malmgren, 1867) and *A. finmarcicha* (M. Sars, 1865) (Alvestad and Kongsrud, pers. obs.). *A. undecima* sp. nov. may easily be distinguished from both by a number of characters in addition to the number of abdominal uncinigers, including body size, the narrow and tapering middle lobe of the prostomium, number and shape of paleae, and arrangement of the branchiae (Holthe, 1986; Parapar et al., 2012; pers. obs.).

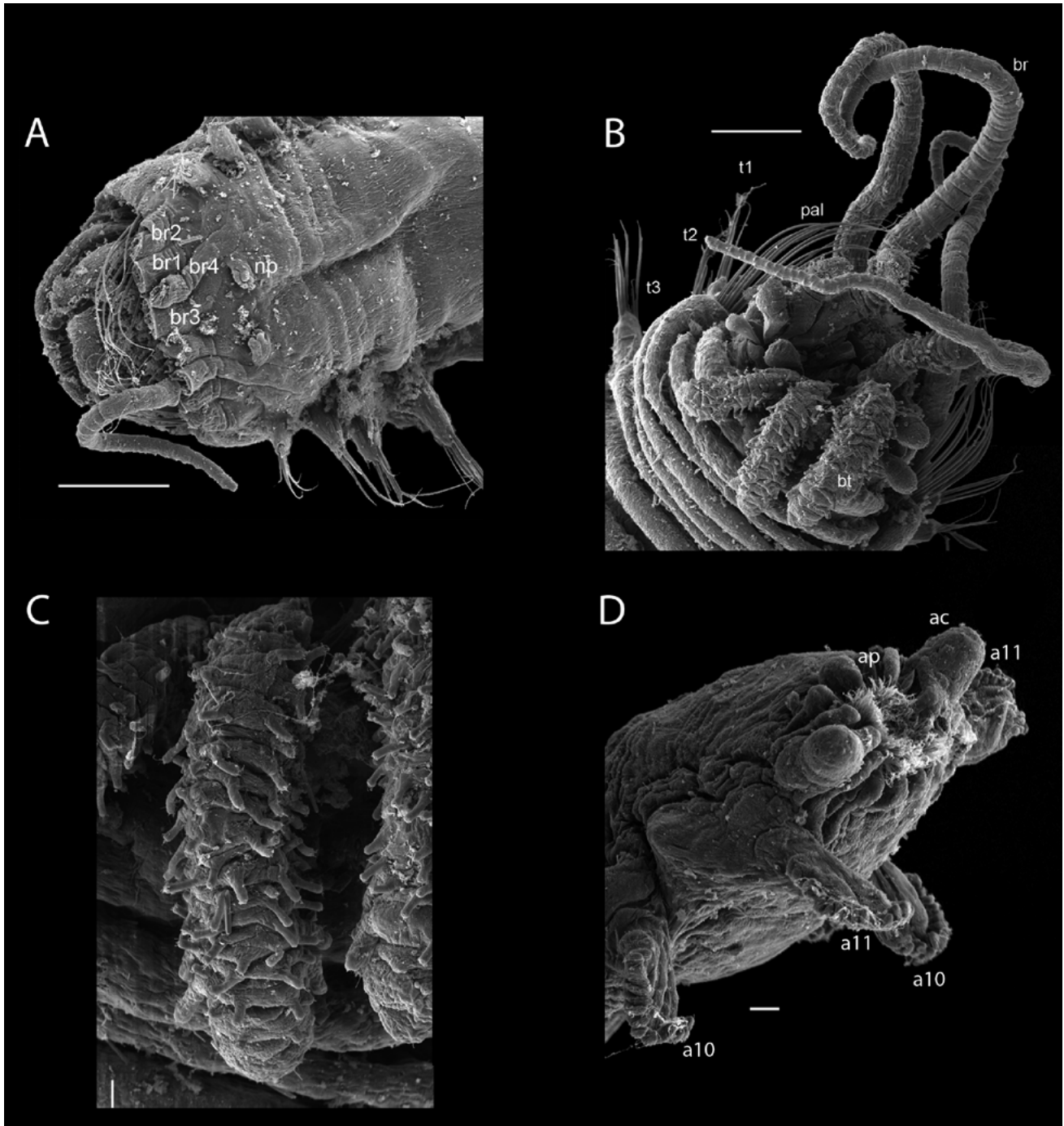


Figure 4. *Ampharete undecima* sp. nov. (A) Head and anterior part of body, dorsal view; (B) head, ventral view; (C) detail of buccal tentacle, enlarged from B; (D) posterior part of body and pygidium, lateral view. A, specimen from RV *H. Mosby* stn 84.05.23.1; B–C, specimen from RV *H. Mosby* stn 83.06.03.2; D, paratype (ZMBN 94023, spm #2). Abbreviations: a10–11, abdominal chaetigers 10–11; ac, anal cirri; ap, anal papillae; br1–4, branchiae; bt, buccal tentacles; np, nephridial papillae; pal, paleae; t1–3, thoracic chaetigers 1–3. Scale bars: 10 μm.

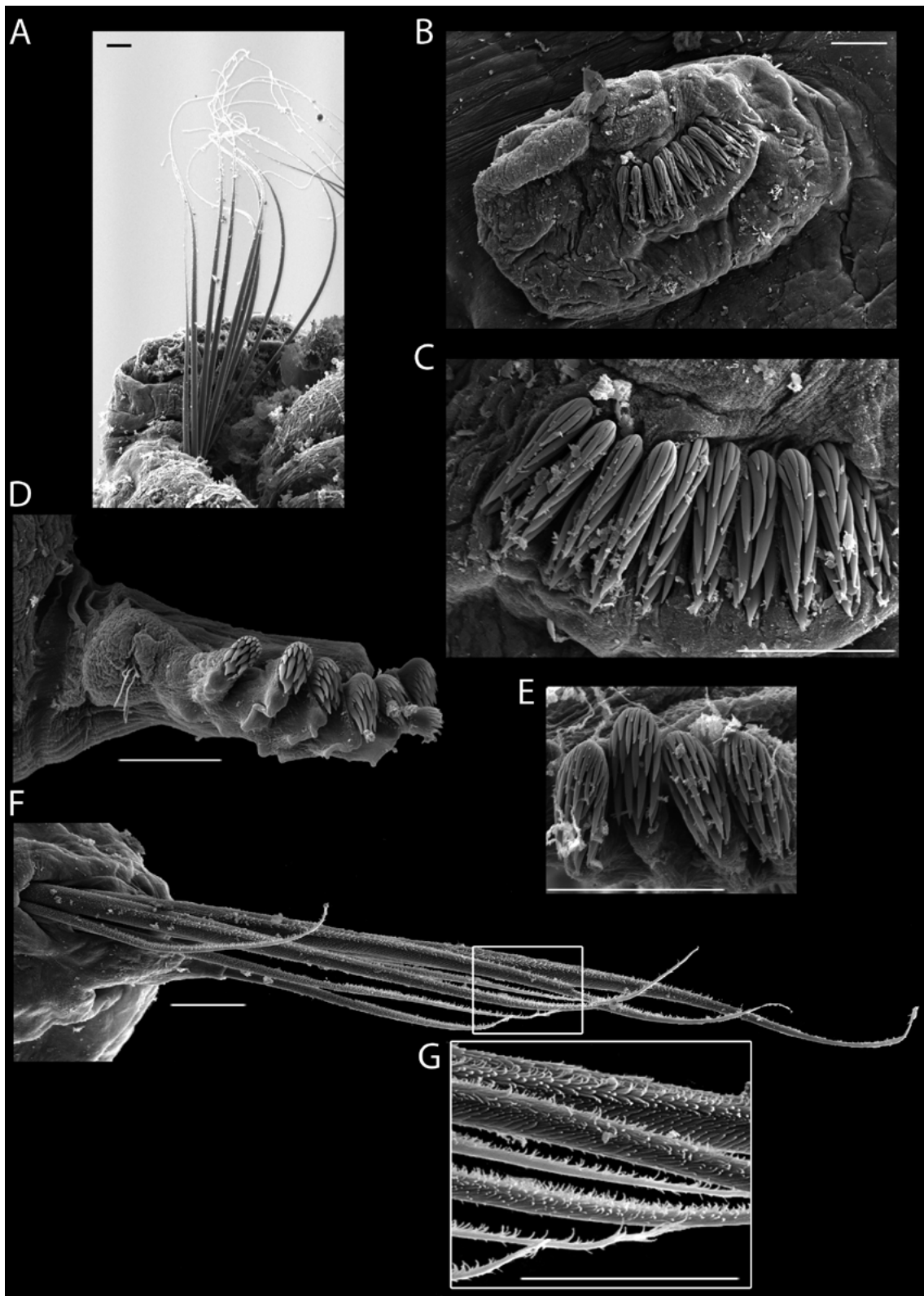


Figure 5. *Ampharete undecima* sp. nov. (A) Details of paleae; (B) thoracic uncini from chaetiger 5; (C) details of thoracic uncini, enlarged from B; (D) abdominal uncini from chaetiger 22; (E) details of abdominal uncini; (F) notopodium with capillary chaetae; (G) scale covering of capillary chaetae, enlarged from F. Scale bars: 10  $\mu$ m.

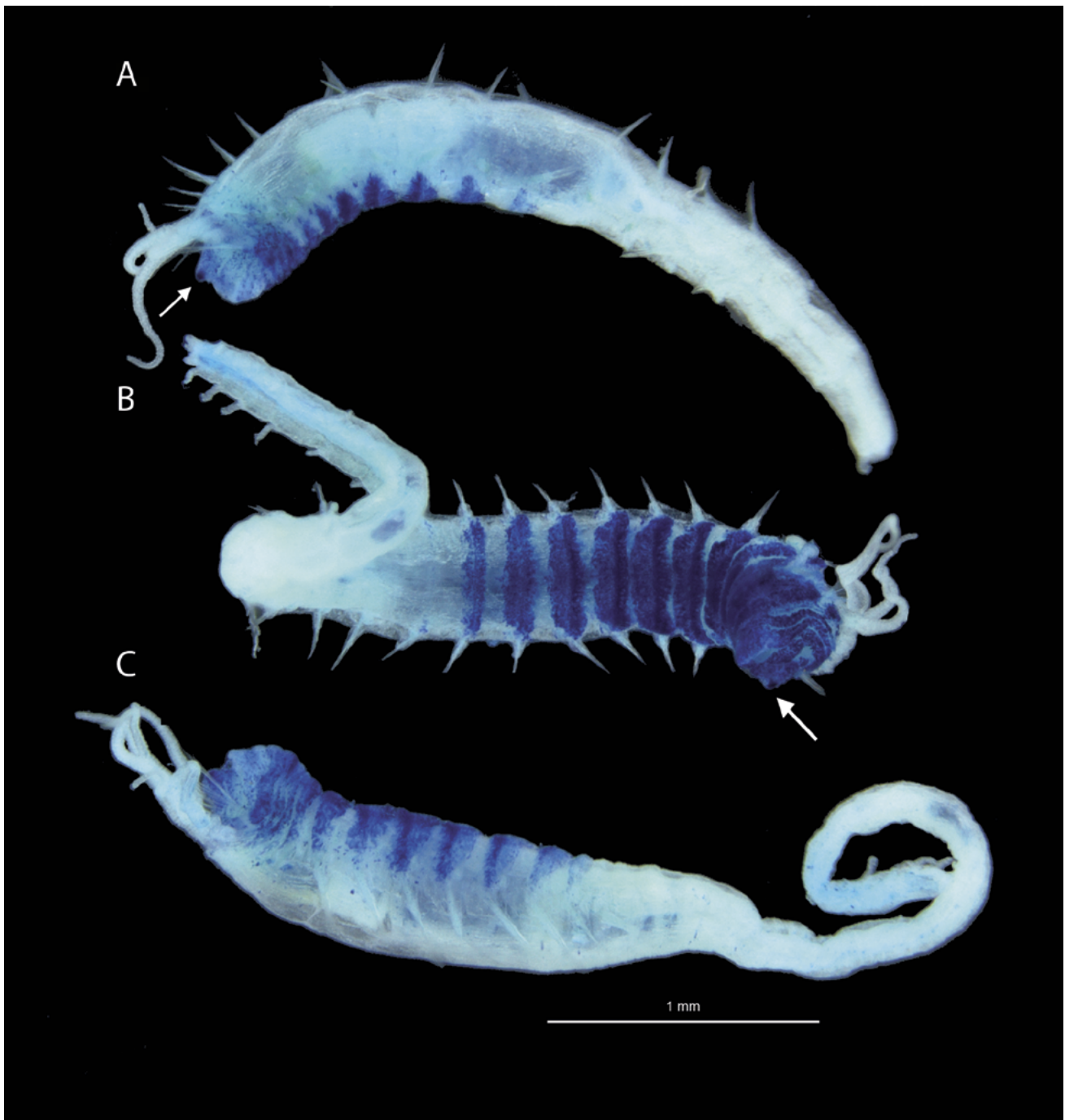


Figure 6. *Ampharete undecima* sp. nov. Paratypes (ZMBN 94024). Methyl blue staining pattern. (A, C) lateral, (B) ventral. Characteristic deep stain on the anterior tip of the prostomium indicated by arrows in figure.

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